Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of 1998 Biennial Regulatory Review -- Amendment of Part 18 of the Commission's Rules to Update Regulations for RF Lighting Devices	)	ET Docket No. 98-42

RESPONSE TO FCC PROPOSED RULE MAKING BY THE INTERNATIONAL MICROWAVE POWER INSTITUTE

10210 Leatherleaf Ct., Manassas, VA 20111-4245
TEL: (703) 257-1415 / FAX: (703) 257-0213
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The International Microwave Power Institute (IMPI) was founded in 1965 to promote the education, research, development and application of electromagnetic technologies, specifically microwave and RF, for dielectric heating and energy transfer. Since its founding, the Institute has become the largest non-profit information resource for ISM technologies with over 700 members and journal subscribers world-wide.

Though the most visible ISM application known to the public is embodied in the 200 million consumer microwave ovens for home cooking, dielectric heating science and equipment is pervasive in manufacturing and process control internationally. It touches virtually every person's life in developed countries through products manufactured by microwave processes such as furniture manufacturing, rubber processing, semi-conductor manufacturing, fiber optics, compact disks, printing on glass and metal, cancer and other medical treatments, pharmaceutical manufacturing, food processing, chemical processing and, of course, individual and commercial food service. Considering ISM technology is used to produce components of virtually all electronic devices manufactured and virtually all fast foods sold and millions of other products, the value of products dependent upon ISM technologies is literally many hundreds of billions of

dollars annually.

ISM technologies contribute to the national economy through manufacturing efficiencies, energy reduction and reduction of toxic waste materials. Such developments were promoted by FCC policy and international treaties, which have allowed this unique technology to develop through specific band allocations reserved for ISM equipment.

Though ISM bands are extremely few in number, they were intended to provide a "safe harbor" for the development and exploitation of ISM applications as the ONLY radio frequency able to transmit energy rather than communications. As such it has been unquestioned that technologies sharing spectrum with ISM equipment must accept any ISM interference within the specified ISM band.

The latest development of RF lighting is, prospectively, the greatest ISM application to serve mankind. Ignoring such benefits as the improved safety and quality of light, the energy savings RF lighting will achieve for facility operations at stadiums, manufacturing plants, municipalities, office buildings, highways, airports and other large users of illumination will reduce operating costs and preserve energy resources beyond any present system imaginable.

As proposed in ET Docket 98-42, limitations for in-band emissions of ISM equipment violates the basic concept of allocating specific spectrum for ISM applications. For decades, the ISM industry has limited its technology development and applications to the very few ISM frequencies set aside for our industry because the very process of energy transmission has long been known to cause interference with communications devices. That was the whole point of limiting ISM applications to very specific bandwidths and the very essence of the requirement that devices sharing ISM bands must accept ISM interference.

The International Microwave Power Institute opposes the proposal to establish in-band limitations on ISM equipment and devices, as such limitations violate the legislative history and

technical intent behind establishment of the present ISM band allocations. Moving ISM frequencies or allowing ISM applications in other bandwidths is impractical and would be detrimental to established communications systems. Since ISM cannot be reallocated, those devices that willfully choose to operate within long-established ISM frequencies do so with a long-standing knowledge that ISM interference must be accepted. To change the rules for the ISM industry (which cannot seek refuge in other frequencies) to accommodate devices that could select multiple bandwidths as a home, would be unconscionable.

On a more technical issue, NPRM 98-42 proposes a modification of Part 18 and as such presumably specifies measurement procedures applicable to Part 18. The Institute believes these still require the use of a "Field-Intensity Meter" to measure the average value of the signal as picked up within a 5 MHz bandwidth.

On the face of it, the NPRM proposes limits from 10 to 20 dB tighter than existing Part 18 Rules, depending on how one interprets Part 18--e.g. using the formula that depends on power or simply the 1500 meter limit. The other part of the variability depends on whether the lighting device is for the consumer or non-consumer. The worst case is for RF lighting for the consumer.

The CISPR 11 limit of 60 dB using a Video Bandwidth of 10 Hz is clearly less restrictive than that in the NPRM for the consumer class, Class B in the CISPR parlance, for which the proposed CISPR limits will apply. Those for industrial and commercial, Class A, (presumably equivalent to the FCC "non-consumer") are under study and presumably will be less restrictive (i.e. higher) than the 60 dB value.

To the extent that both the FCC measurement and the CISPR 10 Hz VB measurement are both "average" one might expect the two to be the same. In fact, there could be significant differences. The Institute notes that in the FCC measurement the resolution bandwidth is 5 MHz whereas in the CISPR procedure it is 1 MHz. Thus to the degree that the out-of-band noise is

broadband, the FCC technique will capture a broader band of noise and thus a larger recorded value. On the other hand, to the degree that the noise is represented by brief temporal peaks both techniques will tend to average. The CISPR limits allow meeting a tight peak limit of 70 dB or alternatively very loose peak limits and a tight average limit.

Table 1

Reference Values of Radiation Limits at 3 Meters (dB/μ V/m) (out of band)

CDRH	127.5	
FCC NPRM 98-53 [Par 18.305(c)]	60 Non-consumer	54 Consumer
FCC Part 18 for microwave ovens [Part 18.305(a)]	71 77 74	for 1 kW per Table for 4 kW per Table per general limit at 1500 meters
CISPR 11 (being voted)		
Basic requirement:	70	peak value.
Alternate reqmnt:	110 92 and 60	peak for 2.3 - 2.4 GHz peak for all other freqs 10 Hz Video Bandwidth at two worst freqs.

Thus if the signal is a CW signal at the 70 dB/μ V/m level it will pass the CISPR, but flunk the FCC limit. (i.e. in the case where the peak = the average). In fact, when one factors in the differences in measurement bandwidth, it is possible that a consumer device could pass the CISPR limit while flunking the FCC limit by (70 - 54 + 10 log 5) = 23 dB. (In fact, the CISPR document explicitly states that the 70 dB limit was derived from CW signal considerations.)

Deliberations within CISPR/TAG-B seem to suggest that CISPR will allow magnetron-driven lamps to be tested under the CISPR/B rules. Therefore, it can be argued that to

the extent that the out-of-band signals are CW the FCC proposal is more than 20 dB stricter than the CISPR rules.

Of course, to the degree that the magnetrons are driven by unfiltered rectified a.c. voltage and to the degree there are mode stirrer and other load variations the signals can become highly impulsive with high peak to average ratios-reflecting peak noise signals only at low currents. One can not be certain, however, because even with the microwave oven there are certain noise and spurious signals that can occur at peak currents with a lower peak to average ratio.

Another factor of uncertainty is the present ambiguity in the specified measurement techniques under CISPR 11. Scan times for all tests are not specified and the max-hold technique is not explicitly specified. Especially for a microwave oven, results will be highly variable depending on scan time and speed and use of the max-hold feature of modern spectrum analyzers. The most stringent requirement in the new CISPR 11 requirements is the 10 Hz video bandwidth measurement using a span of only 10 MHz. But even here, since the scan time and speed are not specified, the Institute believes there is a lot of room for variable results depending on how one chooses or exploits the ambiguity in these parameters. Note again that the max-hold feature is not yet specified.

The FCC proposed limits for lamps are thus much tighter than the CISPR limits. It may be that the FCC believes they are equivalent because of the appearance of the number 60 dB in both documents. If so, this indicates a misinterpretation by the FCC. It is even worse because the FCC applies the 60 dB number to non-consumer and a lower value to consumer.

Based upon the Institute's analysis of the technical merits of NPRM 98-42, the Institute opposes the proposed rulemaking. In addition to the reasons for opposition already given, the proposal, as written, would be an imposition of a severe regulation on microwave lighting, possibly as much as 24 dB tighter than even that proposed by CISPR 11. If adopted, it then could

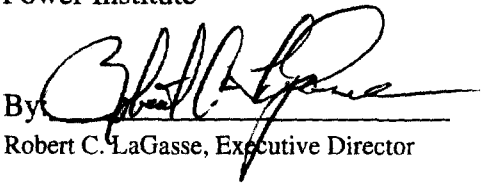
become a precedent for tightening limits on microwave ovens first, and then industrial equipment which is inconsistent with the legislative history of limiting ISM technology to specific bandwidth where "free space" radiation was expected. Furthermore, any in-band limits are a retraction of the basic rule for ISM bands that has always been assumed and applied, i.e., ISM systems are free to radiate in their bands without limit and any devices or systems that operate in the ISM bands must accept any interference caused by ISM sources.

Finally, the Institute opposes any additional restrictions on RF lighting as unwarranted. The current GE waiver demonstrates that the emissions from RF lighting has not caused widespread interference. Therefore, IMPI urges the FCC to drop further restrictions and suggests a relaxation of existing requirements to help expand this valuable technology so vital to our industrial, economic and environmental interests in this country.

The Institute thanks the FCC for the opportunity to respond to ET Docket 98-42 and invites questions and the opportunity to respond as necessary.

International Microwave
Power Institute
10210 Leatherleaf Ct.
Manassas, VA 20111-4245
TEL: (703) 257-1415
FAX: (703) 257-0213
E-mail: AssnCtr@idsonline.com

International Microwave
Power Institute

By 
Robert C. LaGasse, Executive Director